Instructions 3000-940-135-A

BECKMAN

CIRCUITMATE™ DIGITAL MULTIMETERS OPERATOR'S MANUAL for the MODEL DM40 and MODEL DM45

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BECKMAN ELECTRONIC TECHNOLOGIES (BET)
BECKMAN INSTRUMENTS, INC. FULLERTON, CA 92634
August 1983 832128 3000-940-135 Printed in R.O.C.

WARRANTY

90-Day Limited Warranty

CircuitMate™ Digital Multimeters are warranted in entirety against any defects of material or workmanship which develop for any reason whatsoever, except abuse, within a period of 90 days following the date of purchase of the multimeter by the original purchaser. This warranty is extended by Beckman Instruments, Inc. (Beckman) only to the original purchaser or original user of the multimeter, who must, as a CONDITION PRECEDENT TO WARRANTY COVERAGE AND PERFORMANCE THEREUNDER BY BECKMAN, complete and return the Warranty Registration Card, received on purchase of the multimeter.

In the event a defect develops during the warranty period, Beckman will, at Beckman's election, repair or replace the multimeter with a new or reconditioned model of equivalent quality. In order to obtain performance of any obligation of Beckman under the warranty, the original purchaser or original user must return the defective multimeter, postage prepaid, along with a handling charge of $3.00* to:

Beckman Instruments, Inc.
210 Ranger Street
Brea, CA 92621
Attention: Customer Service

In the event of replacement with a new or reconditioned model, the replacement unit will continue the warranty period of the original multimeter. The turnaround time for replacement units at the Service Center is typically only two (2) working days.

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This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

BECKMAN INSTRUMENTS, INC.
Fullerton, California

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Section One
INTRODUCTION

The CircuitMate™ Models DM40 and DM45 are completely portable 3½-digit multimeters designed for use by technicians, servicemen, students, and hobbyists who require an instrument that is accurate, reliable, and always ready for use. Equipped with seven functions and twenty-seven ranges (Model 40) or twenty-nine ranges (Model 45), these instruments provide full capability and convenient use with a single selector switch and tilt bail.

These multimeters include all of the following features as standard:

1. 3½-Digit LCD Display
2. Overload Protection
3. DC Volts — Five Ranges
4. AC Volts — Five Ranges
5. DC Amps — Five Ranges
6. AC Amps — Five Ranges
7. Resistance — Six Ranges
8. Diode Check
9. 10 Amps AC and DC (Model 45)
10. Continuity Beeper (Model 45)
11. Low Battery Voltage Indicator
12. Single Function and Range Selector Switch

NOTE

The symbol ⚠ on the front panel of the instrument is an international symbol meaning "REFER TO OPERATION INSTRUCTIONS." Warnings and safety precautions to avoid personal injury and instrument damage are listed in Section 5.

Section Two
SPECIFICATIONS

Specifications are subject to change without notice.

2.1 GENERAL SPECIFICATIONS

Display	• 3½-digit liquid crystal display (LCD) with a maximum reading of 1999.
Polarity	• Automatic, (−) negative polarity indication.
Zero adjustment	• Automatic
Overrange indication	• Highest digit of (1) or (−1) is displayed.
Low battery indication	• The (LO BAT) is displayed when the battery voltage drops below the operating voltage.
Measurement rate	• 2.5 measurements per second, nominal.
Operating temperature	• 0°C to +35°C 0-80% RH +35°C to +50°C 0-70% RH
Storage temperature	• −20°C to +65°C 0-90% RH with battery removed.
Accuracy	• Accuracy specifications at 23 ±5°C, less than 75% RH.
Power	• Single, standard 9-volt battery, NEDA 1604, JIS 006P, IEC 6F22.
Battery Life (Typical)	• 1. High-Power Zinc-Carbon Premium — 200 hours. 2. Ordinary Zinc-Carbon — 150 hours.
Dimensions	• 6.85 inches (17.4 cm) long × 3.55 inches (9.0 cm) wide × 1.4 inches (3.6 cm) high.

Weight	• 9 ounces (255 grams) including battery.
Accessories	• Test leads (pair), spare fuse (2A), battery, operator's manual.

2.2 ELECTRICAL SPECIFICATIONS

Accuracies are ± (% reading plus number of digits).

At 23 ±5°C, less than 75% RH.

MODEL	DM40	DM45
DC VOLTS		
Ranges	5 – 200mv – 1000V	5 – 200mv – 1000V
Accuracy	± (0.8% reading + 1 digit)	± (0.5% reading + 1 digit)
Input impedance	10MΩ	10MΩ
Overload protection		
200mV range	500 VDC 350 VAC	500 VDC 350 VAC
Other ranges	1200 VDC 850 VAC	1200 VDC 850 VAC
Resolution	100μV	100μV
AC VOLTS		
Ranges	5 – 200mV – 750V	5 – 200mV – 750V
Accuracy	± (1.5% reading + 4 digit) 40 Hz – 1 kHz 750V range: 40 Hz – 400 Hz	± (1.25% reading + 4 digit) 40 Hz – 1 kHz 750V range: 40 Hz – 400 Hz
Input impedance	10MΩ	10MΩ
Overload protection	1200 VDC 850 VAC	1200 VDC 850 VAC
200 mV range	500 VDC (15 sec max) 350 VAC (15 sec max)	500 VDC (15 sec max) 350 VAC (15 sec max)
Resolution	100μV	100μV
DC CURRENT		
Ranges	5 – 200μA – 2A	6 – 200μA – 10A
Accuracy		
200μA – 200mA ranges	± (1.25% reading + 1 digit)	± (1.0% reading + 1 digit)
2A range	± (2.5% reading + 3 digit)	± (2.0% reading + 3 digit)
10A range		± (2.0% reading + 3 digit)

SPECIFICATIONS (Continued)

MODEL	DM40	DM45
DC CURRENT (Cont.)		
Overload protection		
All ranges except 10A	2A/250V fuse	2A/250V fuse
10A range		Unfused
Voltage burden		
All ranges except 2A + 10A	250mV	250mV
2A range	700mV	700mV
10A range		700mV
Resolution	100nA	100nA
AC CURRENT		
Ranges	5 – 200μA – 2A	6 – 200μA – 10A
Accuracy		
200μA – 200mA ranges	± (1.8% reading + 3 digit) 40 Hz – 1 kHz	± (1.5% reading +3 digit) 40 Hz – 1 kHz
2A range	± (3.0% reading + 4 digit) 40 Hz – 400 Hz	± (2.5% reading + 4 digit) 40 Hz – 400 Hz
10A range		± (2.5% reading + 4 digit) 40 Hz – 400 Hz
Overload protection		
All ranges except 10A	2A/250V fuse	2A/250 fuse
10A range		Unfused
Voltage burden		
All ranges except 2A + 10A	250mV	250mV
2A range	700mV	700mV
10A range		700mV
Resolution	100nA	100nA

SPECIFICATIONS (Continued)

MODEL	DM40	DM45
RESISTANCE		
Ranges	6 – 200Ω to 20MΩ	6 – 200Ω to 20MΩ
Accuracy		
200Ω range	± (1.0% reading + 4 digit)	± (0.75% reading + 4 digit)
2KΩ through 2MΩ ranges	± (1.0% reading + 1 digit)	± (0.75% reading + 1 digit)
20MΩ range	± (3.0% reading + 5 digit)	± (2.0% reading + 5 digit)
Diode test	± (2.0% reading + 5 digit)	± (1.5% reading + 5 digit)
Maximum test current		
200Ω range	2mA	2mA
2KΩ range	250μA	250μA
20KΩ range	50μA	50μA
200KΩ range	5μA	5μA
2MΩ range	500nA	500nA
20MΩ range	50nA	50nA
Diode test	1.5mA	1.5mA
Open voltage (max)		
200Ω range	2.6V	2.6V
2KΩ through 20MΩ ranges	1.0V	1.0V
Diode test	3.2V	3.2V
Overload protection	250V DC/AC	250V DC/AC
Instant continuity		
200Ω range		
Accuracy		± (0.75% reading + 5 digit)
Maximum test current		2mA
Open voltage		2.6V
Overload protection		250V DC/AC
Buzzer sounds with resistance less than 100Ω		

Section Three
INSTALLATION

3.1 UNPACKING

Remove the multimeter from the container. The box should contain following items:

1. Multimeter.
2. Test lead set (one red, one black).
3. Operator's Manual.
4. 9-volt battery (located in battery compartment).
5. Two fuses (one installed and one spare).

3.2 BATTERY INSTALLATION

Unpack the battery, which was placed in the battery compartment, and connect the battery to the battery snap (see Paragraph 6.1, Battery Replacement).

CAUTION

Failure to turn off the instrument before installing the battery could result in damage to the instrument and battery if it is connected to the battery terminal incorrectly.

3.3 CLEANING CASE AND WINDOW

The front panel case should be cleaned with a mild solution of detergent and water. Apply sparingly with a soft cloth and allow to dry completely before using.

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. These chemicals will react with plastics used in construction of case.

3.4 BAIL POSITIONING

The bail may be removed from its standard position by squeezing it together and then placed in the top holes, thus permitting the multimeter to hang in vertical position.

Section Four
FRONT PANEL DESCRIPTION

This section is designed to familiarize the user with the controls, indicators, connectors, and other features of the multimeter. It is HIGHLY RECOMMENDED that the user become familiar with the controls, indicators, and connectors shown and described in Figure 1 before operating the device.

1. Digital Display
   Digital display has 3½-digit LCD readout (maximum reading 1999) with automatic polarity, decimal point, overrange, and low battery indicator.
2. Power Switch
   This switch is used to turn the instrument on and off.
3. Function/Range Switch
   This Function/Range Switch greatly simplifies the operation of the instrument. The one switch selects the function and the desired range.
4. COM Input Connector
   This connector is used as the common or low input for all measurements.
5. V-Ω Input Connector
   This connector is used as the high input for all voltage and resistance measurements.
6. 10A Input Connector (Model DM45)
   This connector is used for continuous current measurements from 0 to 10A. Measurements between 10 and 20 amperes for a duration of 30 seconds maximum may also be made using this terminal. Inputs beyond this maximum may cause damage to the instrument.

00.0
DCV
ACV
1000
750
200
20
2
200m
200µ
2m
20m
10A
20M
2M
200K
20K
2K
200
DCA
V·Ω
COM
A
10A
2A MAX
10A MAX
CIRCUITMATE

Figure 1.

Section Five
OPERATION

5.1 WARNINGS

1. Pay extreme caution when working near high-voltage sources. This includes any voltage measurements requiring the use of 200V AC, 750V AC, 200V DC, and 1000V DC ranges.
2. To avoid electrical shock hazard and/or damage to the instrument, do not measure voltages that might exceed 1000 volts above earth ground.
3. Using the A-input connector during current measurements, operator injury or damage to the instrument may occur if the fuse blows in a circuit which exhibits an open-circuit voltage greater than 250 volts
4. Each time before using the instrument, inspect test leads, connectors, and prods for cracks or breaks in the insulation. If any defects are found replace item immediately.
5. To avoid electrical shock hazard, do not touch test lead tips, or the circuit being tested, while power is applied to the circuit being measured

5.2 SAFETY PRECAUTIONS

1. Exceeding the maximum input overload limits can damage the multimeter.
2. When making *current* measurements, make sure that the multimeter is connected in series with the load in which the current is to be measured. NEVER connect the multimeter ACROSS a voltage source. If this is done it may either blow the overload protection fuse or damage the device being tested.

5.3 GENERAL FUNCTIONAL CHECK

Before placing the multimeter into use, a simple checkout procedure will ensure that the device is working properly.

1. Connect the red test lead to the V-Ω input connector and the black test lead to the COM input connector. Touch the red test lead and black test lead together.

2. Place the Function/Range Switch in the DC 1000V, 200V, 20V, 2V and 200mV positions. Observe the digital display; it should read 000 ±1 in each position.
3. Turn the Function/Range Switch to the 20MΩ, 200KΩ, 20KΩ, and 2KΩ positions. With the two test lead tips separated, the digital display should read 1 (overrange). Touch the test lead tips together and observe the digital display; it should read 000 or 001 in each position. In the 200Ω position, the digital display may read 001 to 004, because of test lead resistance.

5.4 DC VOLTAGE MEASUREMENT

1. Connect red test lead to V-Ω input connector and black test lead to COM input connector.
2. Set Function/Range switch to desired DCV position. If magnitude of voltage is not known, set switch to the highest range and reduce until a satisfactory reading is obtained.
3. Turn off power to the device or circuit being tested and discharge all capacitors.
4. Connect test leads to the device or circuit being measured.
5. Turn on power to the device or circuit being measured. Voltage value will appear on the digital display along with the voltage polarity.
6. Turn off power to the device or circuit being tested and discharge all capacitors prior to disconnecting test leads.

5.5 AC VOLTAGE MEASUREMENTS

1. Connect red test lead to V-Ω input connector and black test lead to COM input connector.
2. Set Function/Range Switch to desired ACV position. If magnitude of voltage is not known, set switch to highest range and reduce until a satisfactory reading is obtained.
3. Turn off power to the device or circuit being tested and discharge all capacitors.
4. Connect the test leads to device or circuit being measured.
5. Turn on power to the device or circuit being measured. Voltage value will appear on digital display.
6. Turn off power to the device or circuit being tested and discharge all capacitors prior to disconnecting test leads.

5.6 DC CURRENT MEASUREMENT

1. Connect red test lead to the A input connector for current measurements up to 2 amperes. For current measurements between 2 and 10 amperes, connect red lead to the 10A input connector. Connect black lead to the COM input connector.
2. Set Function/Range Switch to desired DCA position. If magnitude of current is not known, set switch to highest range and reduce until satisfactory reading is obtained. When the 10A input connector is used, the Function/Range Switch should be placed in the $\frac{20m}{10A}$ position.
3. Turn off power to the device or circuit being tested and discharge all capacitors.
4. Open the circuit in which current is to be measured. Now securely connect test leads in series with the load in which current is to be measured.
5. Turn on power to the circuit being tested.
6. Read current value on digital display.
7. Turn off all power to the circuit being tested and discharge all capacitors.
8. Disconnect test leads from circuit and reconnect circuit that was being tested.

5.7 AC CURRENT MEASUREMENTS

1. Connect red test lead to the A input connector for current measurements up to 2 amperes. For current measurements between 2 and 10 amperes, connect red lead to the 10A input connector. Connect black lead to the COM input connector.
2. Set Function/Range Switch to desired ACA position. If magnitude of current is not known, set switch to highest range and reduce until satisfactory reading is obtained. When the 10A input connector is used, the Function/Range Switch should be placed in the $\frac{20m}{10A}$ position.
3. Turn off power to the device or circuit being tested and discharge all capacitors.
4. Open circuit in which current is to be measured. Now securely connect test leads in series with the load in which current is to be measured.
5. Turn on power to the circuit being tested.
6. Read current value on digital display.

7. Turn off all power to the circuit being tested and discharge all capacitors.
8. Disconnect test leads from circuit and reconnect circuit that was being tested.

5.8 RESISTANCE MEASUREMENTS

All resistance ranges on the multimeter are low-power ohms except for the 200-ohm range. The low-power ohm allows accurate measurements of in-circuit resistance.

1. Connect red test lead to the V-Ω input connector and black test lead to the COM input connector.
2. Set Function/Range Switch to desired Ω position. If magnitude of resistance is not known, set switch to highest range and reduce until satisfactory reading is obtained.
3. If the resistance being measured is connected to a circuit, turn off power to the circuit being tested and discharge all capacitors.
4. Connect test leads to the circuit being measured. When measuring high resistance, be sure not to contact adjacent points, even if insulated, because some insulators have a relatively low insulation resistance, causing the measured resistance to be lower than the presumed resistance.
5. Read resistance value on digital display. If a high resistance value is shunted by a large value of capacitance, allow digital display to stabilize.

5.9 DIODE AND TRANSISTOR TEST MEASUREMENTS

The special Diode Test Function allows measurements of forward voltage drops across diodes and transistor junctions. This function also permits measurement of in-circuit semiconductor junctions.

5.9.1 DIODE TESTS

1. Connect red test lead to the V-Ω input connector and black test lead to the COM input conector.
   - Set Function/Range Switch to the diode test (⊣◀) position.
   - If the semiconductor junction being measured is connected to a circuit, turn off power to circuit being tested and discharge all capacitors.
   - Connect test leads to the device.
   - Read forward voltage drop on digital display. Normally the value of a good silicon type diode is 0.600 to 0.900; if 0.605 is displayed, the approximate forward voltage is 605mV.

2. If the digital display reads (1) overrange, reverse the lead connections. The placement of the test leads when the forward voltage is displayed indicates the orientation of the diode. The red lead is then connected to the anode and black lead is connected to the cathode as shown in Figure 2. If (1) overrange is displayed with both lead connections, the junction is open. If a low-reading (less than 1.000) is obtained with both lead connections, the junction is shorted internally or (if the junction is measured in a circuit) the junction is shunted by a resistance less than 1 kΩ. In the latter case, the junction must be disconnected from the circuit in order to verify its operation.

5.9.2 TRANSISTOR JUNCTION TESTS

Transistors can be tested in the same manner as diodes by checking the two diode junctions formed between the base and emitter and the base and collector of the transistor. Measurement between the collector and emitter also should be made to determine if a short is present.

5.10 CONTINUITY CHECKS (DM45 Only)

This continuity check is particularly useful in circuit and cable tracing.

1. Set Function/Range Switch to the continuity check (•)) position.
2. Connect red test lead to the V-A-Ω input connector and black test lead to the COM input connector.
3. Place one test lead probe at one end of cable or circuit to be tested. Use the other test lead to trace the cable or circuit until the circuit is complete. When continuity is established (resistance of cable or circuit is less than 100Ω), a built-in buzzer will sound. If contact in the cable or circuit is maintained long enough, the resistance value of the cable or circuit will appear in the display.

Figure 2.

Section Six
SERVICING INSTRUCTIONS

WARNING

To prevent electrical shock hazard, turn off multimeter and disconnect test leads before removing battery cover or back cover.

6.1 BATTERY REPLACEMENT

1. After disconnecting test leads and turning off multimeter, press battery cover and push in the direction of the arrow to open.
2. The battery is located in the battery compartment as shown in Figure 3.
3. Disconnect battery from instrument and replace with a standard 9-volt transistor battery and replace battery cover.

CAUTION

Failure to turn off the instrument before installing the battery could result in damage to the instrument and battery if it is connected to the battery terminal incorrectly.

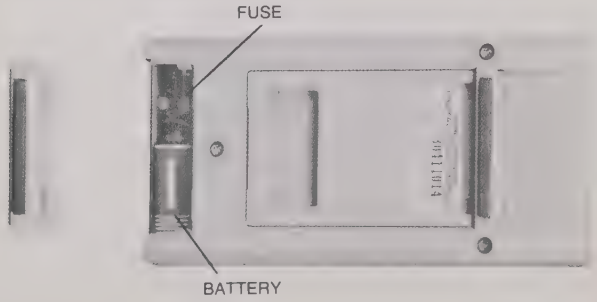


Figure 3.

6.2 FUSE REPLACEMENT

1. After disconnecting test leads and turning off multimeter, press battery cover and push in the direction of the arrow to open.
2. Remove old fuse and replace with spare fuse, replace battery cover

WARNING

To prevent fire, use 2A/250V fuse only.

6.3 CALIBRATION

In order to maintain the specifications described in Section 2 of this manual it is recommended that the multimeter be calibrated once each year. The equipment required for calibration is as follows:

Instrument Type	Required Characteristics	Recommended Models
DC/AC calibrator	Voltage range: 0 to 1000V DC/AC Accuracy: ±0.01%	Rotek 3920 or Equivalent

Use the following procedures to calibrate the multimeter

1. Perform calibration at an ambient temperature of 23 ±2°C and a relative humidity of 75% or less.
   Allow instrument to stabilize at this temperature for at least thirty minutes
2. Remove the back cover from the instrument by removing three screws and then lifing off cover.
3. Set the output of the calibrator for DC 190mV and connect it to the V-Ω and COM input connectors.
4. Turn the Function/Range Switch on the multimeter to the 200mV DC position.
5. Using a small flat-tipped screwdriver adjust potentiometer VR1, as identified in Figure 4 until multimeter digital display reads 190.0 or 190.1
6. Set the output of the calibrator for AC 190mV 400 Hz
7. Turn the Function/Range Switch on multimeter to the 200mV ACV position.
8. Adjust potentiometer VR2 until multimeter digital display reads 190.0 or 190.1.

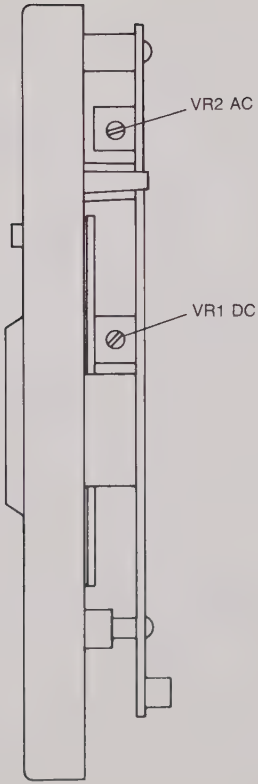


Figure 4.

9. Disconnect calibrator from multimeter.
10. Replace back cover and secure with three screws

6.4 PARTS LIST

CircuitMate DM40 and DM45 Multimeter Assembly

Item No.	Reference Des.	Beckman Part No	Description	Qty	Vendor Part No
1		3001-574-103	Top Case-DM40	1	
1		3001-574-104	Top Case-DM45	1	
2					
3	F1	3001-400-101	Fuse 2A/250V	1	
4		3001-450-107	Shield Folded	1	
5		3001-450-104	Screw #2 .155 LG	1	
6		3001-420-106	Rear Case	1	
7		3001-420-108	Battery Cover	1	
8		3001-450-103	Screw #4 .390 LG	3	
9		3001-420-110	Knob	1	
10		3001-420-107	Bail	1	
11		3001-420-111	Knob, On-Off	1	
12		3001-450-105	Washer #2	1	
13		3001-370-102	Battery Snap	1	

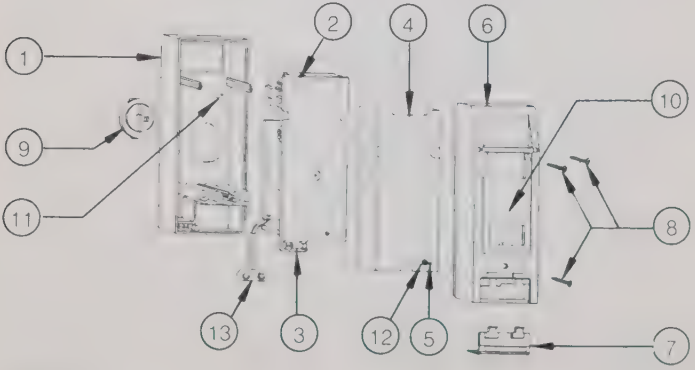


Figure 5.

6.4.1 PARTS LIST

CircuitMate DM40 and DM45 Electronic Assembly

Item No.	Reference Des.	Beckman Part No.	Description	Qty	Vendor Part No.
1		3001-520-102	Small Board, Assembled—DM40	1	
1		3001-520-100	Small Board, Assembled—DM45	1	
2		3001-520-103	Large Board, Assembled—DM40	1	
2		3001-520-101	Large Board, Assembled—DM45	1	
3		3001-370-101	Beeper	1	
4		3001-420-101	Cam	1	
5		3001-420-102	Cam Housing	1	
6		3001-450-100	Screw #2 .240 LG	8	
7		3001-450-105	Washer #2	8	
8		3001-400-100	Switch On-Off	1	
9		3001-420-103	Window	1	
10		3001-920-100	Mask, Window	1	
11		3001-390-100	LCD	1	
12		3001-420-104	Retainer LCD	1	
13		3001-370-100	Carbon Elastomer	1	
14		3001-450-103	Screw #4 .390 LG	2	

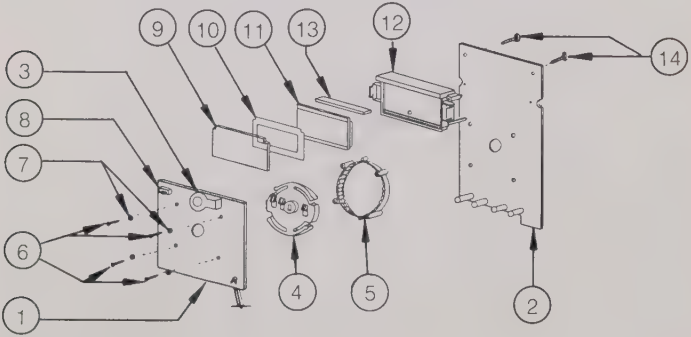


Figure 6.

6.4.2 PARTS LIST

CircuitMate DM40 and DM45 Input Board Assembly

Item No	Reference Des.	Beckman Part No.	Description	Qty	Vendor Part No
1	R22	3001-050-123	Res. 576 Ohms	1	
2	R24	3001-010-204	Res. 200K	1	
3	R21	3001-050-122	Res. 18.2K	1	
4	R33	3001-010-105	Res. 1M Ohms	1	
5	R32	3001-010-102	Res. 10K	1	
6	R31	3001-010-304	Res. 300K	1	
7	R26	3001-010-103	Res. 20K	1	
8	R25	3001-010-104	Res. 100K	1	
9	VR1	3001-090-102	Pot. 200 Ohms	1	
10	C13	3001-100-100	Cap. 470 pF	1	
11	C14, 15	3001-150-101	Cap. 10 μF	2	
12	D10	3001-230-103	Diode, 4003	1	
13	D4 5, 6 7	3001-200-100	Diode, Signal 4148	4	
14	Q2	3001-250-105	Transistor 1402	1	
15	U4	3001-270-115	I.C. HD14011BP	1	
16					
17		3001-450-106	Cable, Flex 7 Pins	1	

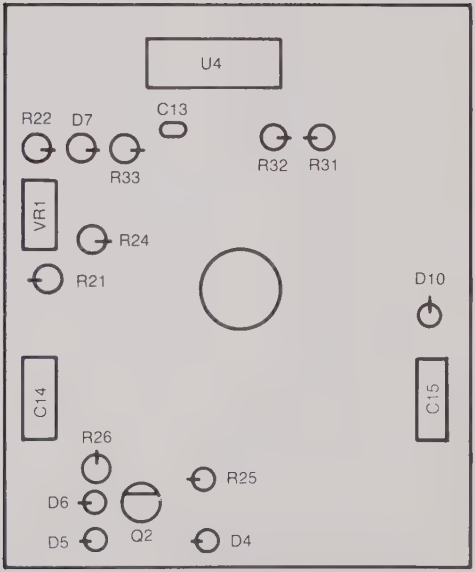

U4
R22
D7
C13
R33
R32
R31
VR1
R24
R21
D10
C14
C15
R26
R25
D6
Q2
D5
D4

Figure 7.

6.4.3 PARTS LIST

CircuitMate DM40 and DM45 Display Board Assembly

Item No.	Reference Des.	Beckman Part NO.	Description	Qty	Vendor Part No.
1	R20	3001-040-100	Res. 0.01 Ohms	1	
2	R19	3001-070-104	Res. 0.09 Ohms	1	
3	R18	3001-010-152	Res. 1.5K	1	
4	R17	3001-010-501	Res. 1K	1	
5	R16	3001-050-126	Res. 100 Ohms	1	
6	R34	3001-010-357	Res. 24.3K	1	
7	R35	3001-010-442	Res. 442K	1	
8	R7, 36	3001-030-105	Res. 1M Ohms	2	
9	R3, 4, 5, 30	3001-010-104	Res. 100K	4	
10	R13, 14, 27–29	3001-010-105	Res. 1M Ohms	5	
12	R2	3001-010-464	Res. 82.5K	1	
13	R11	3001-010-471	Res. 470K	1	
14	R12	3001-050-127	Res. 4.32K	1	
15	R9	3001-050-128	Res. 10K	1	
16	R8	3001-010-905	Res. 9M Ohms	1	
17	R6	3001-010-226	Res. 113K	1	
18	R15	3001-010-150	Res. 4.7K	1	
19	VR2	3001-090-102	Pot. 500 Ohms	1	
20	D8, 9	3001-203-103	Diode, 4003	2	
21	D1, 2, 3	3001-200-100	Diode, Signal 4148	3	
22	ZD4	3001-230-100	Diode, Zener	1	
23	C11	3001-100-105	Cap. 120 pF	1	
24	C4, 5	3001-130-114	Cap. 0.1 μF	2	
25	C3	3001-130-115	Cap. 0.01 μF	1	
27	C1, 2	3001-130-117	Cap. 0.22 μF	2	
28	C9	3001-150-103	Cap. 1 μF	1	
29	C10	3001-100-106	Cap. 1000 pF	1	
30	C8	3001-150-104	Cap. 0.22 μF	1	
31	C7	3001-150-105	Cap. 4.7μF	1	

CircuitMate DM40 and DM45 Display Board Assembly (Continued)

Item No.	Reference Des.	Beckman Part No.	Description	Qty	Vendor Part No.
32	C6	3001-100-107	Cap. 100 pF	1	
33	Q1	3001-250-106	Transistor 8050	1	
34	RN-1	3001-310-109	Attenuator	1	
35	U1	3001-270-116	I.C. 7106CPL	1	
36	U3	3001-270-117	I.C. HD14070	1	
37	U2	3001-270-118	I.C. TL062CP	1	
38	PTC	3001-040-103	Potentiometer, 500 Ohms	1	
39	R10	3001-010-103	Res. 10K	1	
40	ZD1, 2	3001-230-106	Diode, Zener	2	
41	RN-2	3001-40-101	Shunt	1	

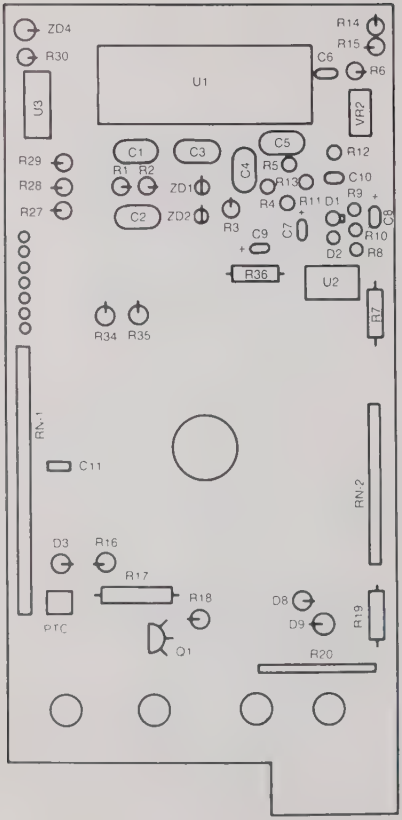
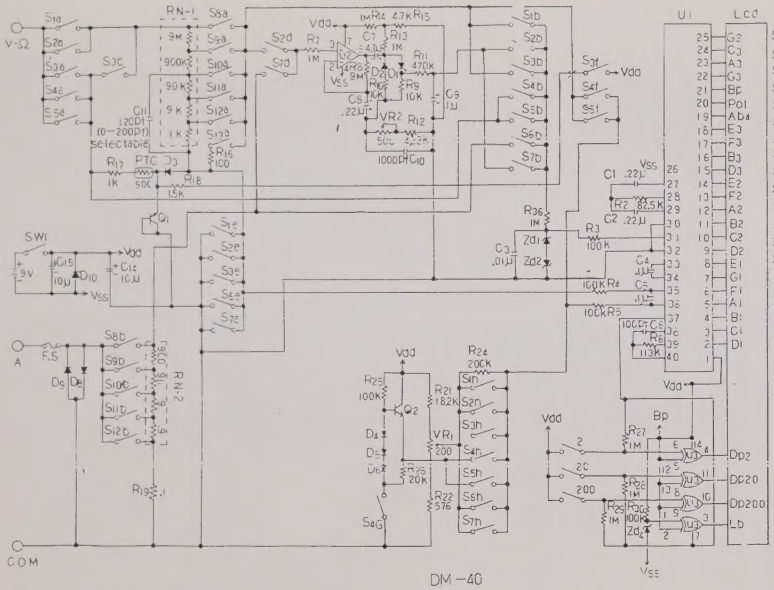
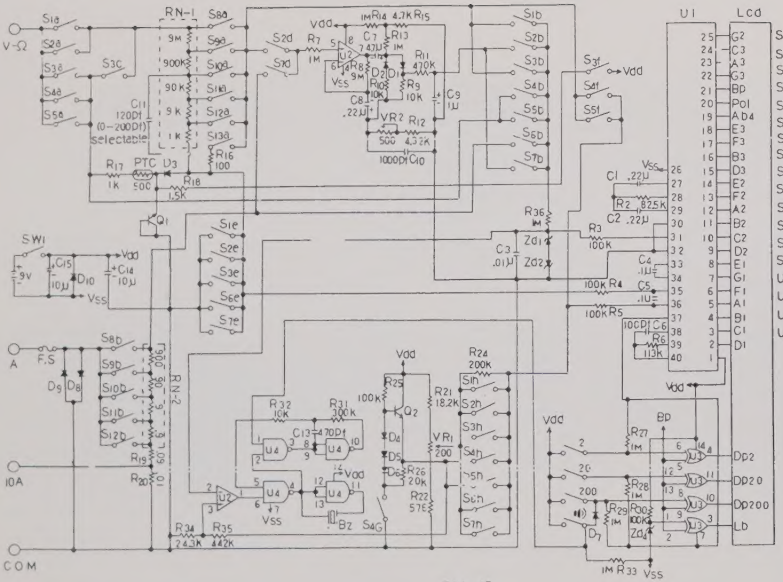

ZD4
R30
U3
U1
R14
R15
C6
R6
VR2
C1
C3
C5
R29
R28
R27
R1
R2
ZD1
ZD2
C2
C4
R5
R13
R4
R3
R12
C10
R9
R11
D1
C8
R10
R8
D2
C9
C7
R36
U2
R7
R34
R35
RN-1
C11
RN-2
D3
R16
R17
R18
PTC
Q1
D8
D9
R19
R20

Figure 8.



Model DM40 Circuit Schematic Diagram



Model DM45 Circuit Schematic Diagram

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